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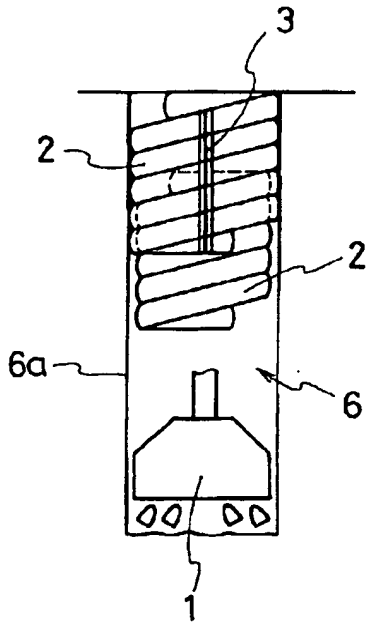
(54)【発明の名称】　深礎用掘削孔壁のライニング工法

(57)【要約】

【目的】　大きい口径の掘削孔でも、掘削の進行にともなって孔壁の崩壊を防止でき、その結果、早急な状態維持と安定の確保を実現できる。

【構成】　螺旋形コルゲートパイプ２の長さ方向に内側への縦帯状折り曲げヒンジ部３を形成して縮径可能とし、掘削の進行にともない、該螺旋形コルゲートパイプ２を縮径状態で拡径して孔壁６ａに圧着した既設の螺旋形コルゲートパイプ２内を通過させて降ろし、次いで拡径して前記既設の螺旋形コルゲートパイプ２の下端に接続していく。



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【特許請求の範囲】

【請求項１】　螺旋形コルゲートパイプの長さ方向に内側への縦帯状折り曲げヒンジ部を形成して縮径可能とし、掘削の進行にともない、該螺旋形コルゲートパイプを縮径状態で拡径して孔壁に圧着した既設の螺旋形コルゲートパイプ内を通過させて降ろし、次いで拡径して前記既設の螺旋形コルゲートパイプ下端に接続していくことを特徴とする深礎用掘削孔壁のライニング工法。

【請求項２】　縮径させた螺旋形コルゲートパイプは、既設の螺旋形コルゲートパイプの内側に重ねてこれをガイドとして螺旋に沿って回転させて降ろす請求項１記載の深礎用掘削孔壁のライニング工法。

【請求項３】　縮径状態で降ろす螺旋形コルゲートパイプは内側に押し広げ治具をセットしておく請求項１および請求項２記載の深礎用掘削孔壁のライニング工法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、深礎用の掘削孔の崩壊防止、安定維持を行う掘削孔壁のライニング工法に関するものである。

【０００２】

【従来の技術】深礎用の掘削孔の崩壊防止、安定維持を行うには、従来は掘削終了後に鋼製のケーシングパイプを掘削孔内にセットすることにより行われていた。

【０００３】

【発明が解決しようとする課題】このように掘削終了後の鋼製のケーシングパイプによる防護のみでは、掘削の作業中には崩壊防止に対する具体的な対策がなされておらず、常に崩壊の可能性を残し危険が付きまとっていた。

【０００４】なお、ケーシングオーガー工法などで、オーガースクリューの外側に鋼管ケーシングを配してこれを回転駆動してオーガースクリューと同時に建て込み、掘削完了後鋼管ケーシングのみを残してオーガースクリューを引き上げ、鋼管ケーシングにより崩壊防止とすることもある。

【０００５】しかし、回転駆動して建込まれる鋼管ケーシングはその駆動機構からして比較的径の小さいものに限定され、大口径の掘削孔には適用できない。

【０００６】本発明の目的は前記従来例の不都合を解消し、大きい口径の掘削孔でも、掘削の進行にともなって孔壁の崩壊を防止でき、その結果、早急な状態維持と安定の確保を実現できる深礎用掘削孔壁のライニング工法を提供することにある。

【０００７】

【課題を解決するための手段】本発明は前記目的を達成するため、螺旋形コルゲートパイプの長さ方向に内側への縦帯状折り曲げヒンジ部を形成して縮径可能とし、掘削の進行にともない、該螺旋形コルゲートパイプを縮径状態で拡径して孔壁に圧着した既設の螺旋形コルゲートパイプ内を通過させて降ろし、次いで拡径して前記既設の螺旋形コルゲートパイプ下端に接続していくこと、および、縮径させた螺旋形コルゲートパイプは、既設の螺旋形コルゲートパイプの内側に重ねてこれをガイドとして螺旋に沿って回転させて降ろすこと、さらに、縮径状態で降ろす螺旋形コルゲートパイプは内側に押し広げ治具をセットしておくことを要旨とするものである。

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【０００８】

【作用】請求項１記載の本発明によれば、掘削の進行に伴い螺旋形コルゲートパイプを順次セットすることで、掘削孔の崩壊をなくし、早急な状態維持と安定の確保を実現できる。

【０００９】請求項２記載の本発明によれば、前記作用に加えて、既設の螺旋形コルゲートパイプをガイドとして降ろすので、接続の位置決めが容易に行える。

【００１０】請求項３記載の本発明によれば、前記作用に加えて、螺旋形コルゲートパイプの内側に押し広げ治具を予めセットしておくことで、降ろしてからの拡径による孔壁への圧着作業を簡単に行うことができる。

【００１１】

【実施例】以下、図面について本発明の実施例を詳細に説明する。図１～図３は本発明の深礎用掘削孔壁のライニング工法の１実施例を示す各工程の側面図、図４～図６は同上平面図である。

【００１２】図中１は掘削機、２は螺旋形コルゲートパイプで、先にこの螺旋形コルゲートパイプ２から説明する。

【００１３】本発明では螺旋形コルゲートパイプ２は、周壁の一部を長さ方向に伸びる二つの帯片として分割し、これらの片の端端を螺番で連接して内側への縦帯状の折り曲げヒンジ部３を形成して縮径可能なものとした。

【００１４】さらに、螺旋形コルゲートパイプ２は、螺旋の先端部、および終端部に図９、図10に示すような凹部４と凸部５による相互係止部を設けている。

【００１５】次に、かかる螺旋形コルゲートパイプ２を使用して行う本発明工法について説明する。図１、図４に示すように掘削機１で孔６を掘削していくが、その上方では螺旋形コルゲートパイプ２を孔壁６ａに圧着するようにセットする。

【００１６】この場合、第１番目の螺旋形コルゲートパイプ２は図７、図８に示すように折り曲げヒンジ部３を内側へ折り曲げて縮径状態とし、また、内側に油圧や空気圧シンンダーによる伸縮可能なアームにより形成した押し広げ治具７をセットしておき、前記孔６内に吊り降ろして、押し広げ治具７により折り曲げヒンジ部３が伸びるように全体を拡径する。

【００１７】なお、押し広げ治具７は螺旋形コルゲートパイプ２とは別個に後でセットするようにするものでもよい。押し広げ機構としては油圧や空気圧シンンダーに

よる伸縮可能なアームの他に空気圧で膨らむ袋体等の利用も考えられる。

【００１８】掘削機１での掘削の進行にともない、図２、図５に示すように第２番目の螺旋形コルゲートパイプ２を縮径状態で、前記拡径して孔壁６ａに圧着した既設の螺旋形コルゲートパイプ２の内側に重ねてこれをガイドとして螺旋に沿って回転させて降ろす。この回転させながらの挿入は前記押し広げ治具７により行うことができる。

【００１９】そして既設の螺旋形コルゲートパイプ２内を通過させて降ろしたところで、押し広げ治具７により折り曲げヒンジ部３が伸びるように全体を拡径して孔壁６ａに圧着し、その際に前記既設の螺旋形コルゲートパイプ２の先端の凹部４に終端部の凸部５を係合させて接続する。

【００２０】このようにして、掘削機１での掘削の進行にともない、順次螺旋形コルゲートパイプ２を接続して孔壁６ａを防護していく。

【００２１】

【発明の効果】以上述べたように本発明の深礎用掘削孔壁のライニング工法は、大きい口径の掘削孔でも、掘削の進行にともなって孔壁の崩壊を防止でき、その結果、早急な状態維持と安定の確保を実現できるものである。

【図面の簡単な説明】

【図１】本発明の深礎用掘削孔壁のライニング工法の１＊

＊実施例を示す第１工程の側面図である。

【図２】本発明の深礎用掘削孔壁のライニング工法の１実施例を示す第２工程の側面図である。

【図３】本発明の深礎用掘削孔壁のライニング工法の１実施例を示す第３工程の側面図である。

【図４】本発明の深礎用掘削孔壁のライニング工法の１実施例を示す第１工程の平面図である。

【図５】本発明の深礎用掘削孔壁のライニング工法の１実施例を示す第２工程の平面図である。

【図６】本発明の深礎用掘削孔壁のライニング工法の１実施例を示す第３工程の平面図である。

【図７】本発明で使用する螺旋形コルゲートパイプの要部の斜視図である。

【図８】本発明で使用する螺旋形コルゲートパイプの平面図である。

【図９】本発明で使用する螺旋形コルゲートパイプの端部の接続前の説明図である。

【図１０】本発明で使用する螺旋形コルゲートパイプの端部の接続後の説明図である。

【符号の説明】

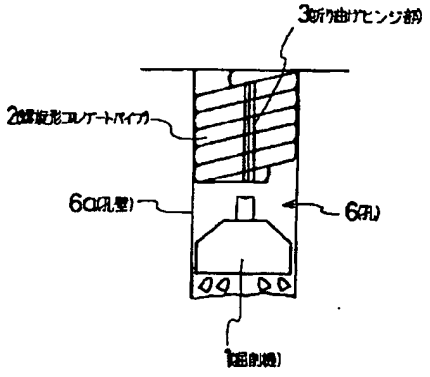
１…掘削機　　２…螺旋形コルゲートパイプ

３…折り曲げヒンジ部　　４…凹部

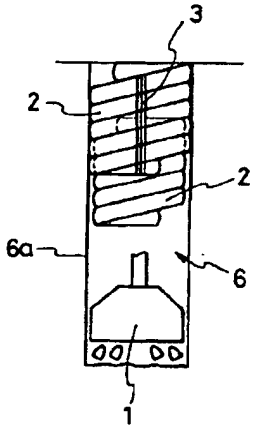
５…凸部　　６…孔

６ａ…孔壁　　７…押し広げ治具

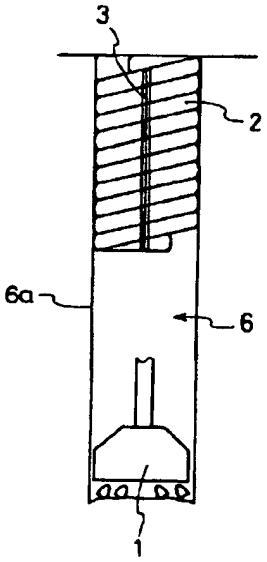
【図１】



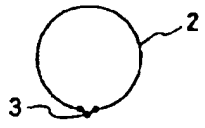
【図２】



【図３】



【図４】



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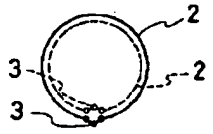
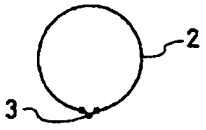
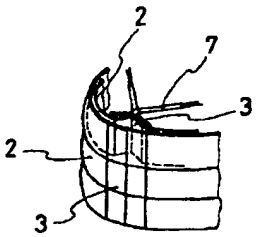


【図６】



【図7】



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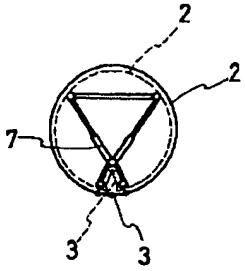
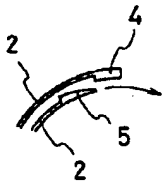
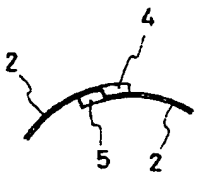


【図9】



【図10】



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(54) Title of the Invention: A LINING CONSTRUCTION METHOD FOR A DEEP FOUNDATION BOREHOLE WALL

(57) Summary

(Purpose)
To make possible, even in the case of high caliber boreholes, the prevention of the collapse of the hole wall as boring advances, making it possible, as a result, to secure the maintenance and stability of immediate conditions.

(Configuration)

The paly folding hinge section 3 is established lengthwise to the interior of the helical corrugated pipe 2, and diameter reduction is enabled. With the advance of boring, the diameter of this helical corrugated pipe 2 is expanded when it is in its reduced state, and it is passed through the interior of the existing helical corrugated pipe 2, which is pressed into hole-wall 6a, and lowered. The diameter of this helical corrugated pipe 2 is then expanded, and it is attached to the lower edge of the aforementioned existing helical corrugated pipe 2.

[see original for Figure]

(Scope of the Patent Claim)

(Claim 1)
A lining construction method for a deep foundation borehole wall with the defining characteristics that: (1) a paly folding hinge section is established lengthwise to the interior of a helical corrugated pipe, and diameter reduction is enabled. (2) With the advance of boring, the diameter of this helical corrugated pipe is expanded when it is in the reduced state, and it is passed through the interior of an existing helical corrugated pipe, which is pressed into the hole-wall, and lowered. (3) The diameter of this helical corrugated pipe is then expanded, and it is attached to the lower edge of the aforementioned existing helical corrugated pipe.

(Claim 2)
The lining construction method for a deep foundation borehole wall described in Claim 1, in which the helical corrugated pipe of the reduced diameter is superimposed on the interior of the existing helical corrugated pipe, and using this as a guide, it is rotated along a helix and lowered.

(Claim 3)
The lining construction method for a deep foundation borehole wall described in Claim 1 and Claim 2, in which expanding jigs are established on the interior of the helical corrugated pipe that has been lowered in its diameter-reduced state.

(Detailed Explanation of the Present Invention)

(0001)
(Field of Industrial Utilization)
The present invention is concerned with a lining construction method of a borehole wall in which the collapse of deep foundation boreholes is prevented, and stabilization/maintenance are conducted.

(0002)
(Conventional Technology)
In conducting collapse prevention and stabilization/maintenance of deep foundation boreholes, conventional methods have been implemented by establishing steel casing pipe on the inside of the boreholes after boring is completed.

(0003)
(Problems Addressed by the Present Invention)
With this sort of protection alone, which is performed through steel casing pipe after boring is complete, concrete countermeasures with regard to collapse prevention during the boring operation have not been established, leaving the possibility of collapse at any time and risking danger.

(0004)
Moreover, there are also cases in which, using such construction methods as auger casing methods, steel pipe casing is arranged on the exterior of the auger screw and rotated, and built simultaneously with the auger screw. In such cases, the steel pipe casing alone is left to remain after boring is completed, the auger screw is withdrawn, and collapse prevention is performed through the steel pipe casing.

(0005)
However, with regard to steel pipe casing that is rotated and built, the casing is limited to that which has a relatively small diameter due to this driving mechanism, and cannot be applied to boreholes of a large diameter.

(0006)
The purpose of the present invention is to provide a lining construction method for a deep foundation borehole wall in which, even in the case of high caliber boreholes, the prevention of the collapse of the hole wall as boring

advances is enabled, and as a result, it becomes possible secure the maintenance and stability of immediate conditions.

(0007)
(Means to Resolve these Problems)
In order to achieve the aforementioned purpose, the present invention consists of the following three main points: (1) (a) A paly folding hinge section is established lengthwise to the interior of a helical corrugated pipe, and diameter reduction is enabled. (b) With the advance of boring, the diameter of this helical corrugated pipe is expanded when it is in the reduced state, and it is passed through the interior of an existing helical corrugated pipe, which is pressed into the hole-wall, and lowered. (c) The diameter of this helical corrugated pipe is then expanded, and it is attached to the lower edge of the aforementioned existing helical corrugated pipe. (2) The helical corrugated pipe of the reduced diameter is superimposed on the interior of the existing helical corrugated pipe, and using this as a guide, it is revolved along a helix and lowered. Finally, (3) expanding jigs are established on the interior of the helical corrugated pipe that has been lowered in its diameter-reduced state.

(0008)
(Effects)
Through the present invention described in Claim 1, by sequentially establishing helical corrugated pipes with the advance of boring, borehole collapse is eliminated and it becomes possible to secure the maintenance and stability of immediate conditions.

(0009)
Through the present invention described in Claim 2, in addition to the aforementioned effects, the pipe is lowered using the existing helical corrugated pipe as a guide, so the connection position can be easily determined.

(0010)
Through the present invention described in Claim 3, in addition to the aforementioned effects, by establishing expanding jigs in advance into the interior of the helical corrugated pipe, conducting pressing operations to the hole-wall through diameter-expansion after lowering the pipe becomes simple.

(0011)
(Embodiments)
Below, we will describe in detail through Figures the embodiments of the present invention. Figures 1 ~ 3 are lateral view Figures of all of the processes that demonstrate one embodiment of the lining construction method of a deep foundation borehole wall of the present invention, and Figures 4 ~ 6 are horizontal projections of these processes.

(0012)
Within the Figures, 1 is the boring machine and 2 is the helical corrugated pipe. We will begin by first explaining this helical corrugated pipe.

(0013)
With the present invention, we divided a portion of the peripheral wall of the helical corrugated pipe 2 into two bands that extend lengthwise, connected the ends of these bands with a hinge, and formed the paly folding hinge 3 into the interior, enabling diameter reduction.

(0014)
Furthermore, through such depressions 4 and protrusions 5 as those shown in Figure 9 and Figure 10, we construct mutual retention sections at the helix tip and trailer portions of the of the helical corrugated pipe 2.

(0015)
Next, we will explain the construction method of the present invention that utilizes this helical corrugated pipe 2. As shown in Figure 1 and Figure 4, we bore the hole 6 with boring machine 1, and we set the system such that, in the upper region, the helical corrugated pipe 2 presses into hole-wall 6a.

(0016)
In this case, we fold the folding hinge 3 into the interior, as shown in Figure 7 and Figure 8, and cause the first helical corrugated pipe 2 to be in its diameter-reduced state. Also, on the interior of the pipe we establish the expanding jig 7, which is formed from an arm that can be expanded/contracted with hydraulic or pneumatic cylinders, hang and lower it into the aforementioned hole 6, and diameter-expand the entire system with the expanding jig 7 such that the folding hinge portion 3 extends.

(0017)
Moreover, as for the expanding jig 7, a jig that is established separately after helical corrugated pipe 2 would also be satisfactory. As an expanding mechanism, in addition to an arm that can be expanded/contracted with hydraulic or pneumatic cylinders, a balloon that swells with air pressure, for example, could also be considered.

(0018)
With the advance of boring using boring machine 1, we superimpose the second helical corrugated pipe 2 in its diameter-reduced state onto the interior of the existing helical corrugated pipe 2 that has been diameter-expanded as previously described and pressed into hole-wall 6a, as shown in Figure 2 and Figure 5. Using this as a guide, we rotate the pipe along a helix and lower it. The insertion of the pipe while rotating can also be performed with the aforementioned expanding jig 7.

(0019)
Then, after passing the pipe through the interior of the existing helical corrugated pipe 2 and lowering it, we diameter-expand the entire system with the expanding jig 7 such that the folding hinge 3 extends, and we press it into hole-wall 6a. At this time, we engage and connect the depression 4 at the tip and the protrusion 5 at the trailer of the aforementioned existing helical corrugated pipe 2.

(0020)
Proceeding in this fashion, with the advance of boring using boring machine 1, we sequentially connect the helical corrugated pipes 2, and protect the hole-wall 6a.

(0021)
(Effect of the Invention)
As stated above, the lining construction method for a deep foundation borehole wall of the present invention makes possible, even in the case of high caliber boreholes, the prevention of the collapse of the hole wall as boring advances, and as a result, makes it possible to secure the maintenance and stability of immediate conditions.

(Simple Explanation of the Figures)

(Figure 1) A lateral view Figure of the first process that demonstrates one embodiment of the lining construction method of a deep foundation borehole wall of the present invention.
(Figure 2) A lateral view Figure of the second process that demonstrates one embodiment of the lining construction method of a deep foundation borehole wall of the present invention.
(Figure 3) A lateral view Figure of the third process that demonstrates one embodiment of the lining construction method of a deep foundation borehole wall of the present invention.
(Figure 4) A horizontal projection of the first process that demonstrates one embodiment of the lining construction method of a deep foundation borehole wall of the present invention.
(Figure 5) A horizontal projection of the second process that demonstrates one embodiment of the lining construction method of a deep foundation borehole wall of the present invention.
(Figure 6) A horizontal projection of the third process that demonstrates one embodiment of the lining construction method of a deep foundation borehole wall of the present invention.
(Figure 7) An oblique perspective figure of the relevant parts of the helical corrugated pipe used in the present invention.
(Figure 8) A horizontal projection of the helical corrugated pipe used in the present invention.
(Figure 9) An explanatory Figure of the terminal portions of the helical corrugated pipe used in the present invention before connection.
(Figure 10) An explanatory Figure of the terminal portions of the helical corrugated pipe used in the present invention after connection.

(Explanation of Symbols)
1...Boring machine
2...Helical corrugated pipe
3...Folding hinge section
4...Depression
5...Protrusion
6...Hole
6a...Hole-wall
7...Expanding jig

(Figure 1)
3 (Folding hinge section)
2 (Helical corrugated pipe)
6a (Hole-wall)
6 (Hole)
1 (Boring machine)

[see original for Figures]

(Figure 2)

(Figure 3)

(Figure 4)

(Figure 5)

(Figure 6)

(Figure 7)

(Figure 8)

(Figure 9)

(Figure 10)

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AFFIDAVIT OF ACCURACY

I, Kim Stewart, hereby certify that the following is, to the best of my knowledge and belief, a true and accurate translation performed by professional translators of *Patent H7-102875* from Japanese to English.

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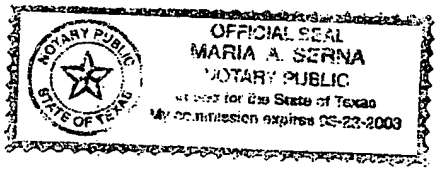
Sworn to before me this
9th day of October 2001.

Maria A Serna

Signature, Notary Public



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